भारतीय मानक
Indian Standard

IS 17659 : 2021

पॉलिएस्टर पोलीओल — विशिष्टि

Polyester Polyol — Specification

ICS 83.040.01

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November 2021 **Price Group 2**

Plastics Sectional Committee, PCD 12

FOREWORD

This Indian Standard was adopted by the Bureau of Indian Standards, after the draft finalized by the Plastics Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

Polyester polyol is primarily used in the manufacture of polyurethanes and this standard refers only to the applications in polyurethanes. Polyurethane is a compound derived out of an exothermic reaction between diisocyanates and polyol in the presence of a catalyst, surfactant etc. It can be polyester polyol or polyether polyol.

Polyester polyols are manufactured from aliphatic diacids (or esters), aromatic diacids (or esters or anhydrides) or caprolactone. They are prepared by the reaction of a diacid, di ester or caprolactone with a glycol or a polyhydric alcohol. However, occasionally a mixture of aliphatic and aromatic acids may be used. The range of molecular weights depends on the relative amounts of the glycol and acids, the reaction conditions and the desired end use as the case may be like in flexible foam, rigid foam, coatings, adhesives sealants and elastomers.

The reaction of diacid and glycol to produce polyester involves an equilibrium with water and the removal of water results in the reaction to completion. Polyester polyols contain reactive hydroxyl (OH) groups which react with isocyanates (NCO) groups to form polyurethanes.

Various applications of polyester polyol include rigid insulation foams, flexible polyester foams, micro-cellular foams for elastomeric and footwear applications, non-cellular one’s for coatings, adhesives, sealants, flexible packaging and other applications.

Based on the recommendations of Department of Chemicals and Petrochemicals, Ministry of Chemicals and Petrochemicals, the Committee has decided to formulate Indian Standard on Polyester Polyol.

The composition of the Committee responsible for formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 ‘Rules for rounding off numerical values (*revised*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standards

POLYESTER POLYOL — SPECIFICATION

1 SCOPE

1.1 This standard prescribes the requirements, methods of sampling and tests for polyester polyols.

1.2 This standard does not cover bio-based or natural oil based polyols.

2 REFERENCE

The following standards contain provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreement based on standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No./Other Publication	*Title*
5299 : 2001	Methods of sampling and tests for dye intermediates (*first revision*)
13360 (Part 11/Sec 11) : 1999/ ISO 3219 : 1993	Plastics — Method of testing: Part 11 Special properties, Section 11 Polymers/resins in the liquid state or as emulsions or dispersions — Determination of viscosity using a rotational viscometer with defined shear rate
15030 : 2001	Terephthalic acid — Specification
ISO 14900 : 2017	Plastics — Polyols for use in the production of polyurethane — Determination of hydroxyl number
ASTM D4274-16	Standard Test Methods for Testing Polyurethane Raw Materials: Determination of Hydroxyl Numbers of Polyols
ASTM D4662-20	Standard Test Methods for Polyurethane Raw Materials: Determination of Acid and Alkalinity Numbers of Polyols
ASTM E203-16	Standard Test Method for Water Using Volumetric Karl Fischer Titration

3 GRADE

Polyester polyols shall be of the following three grade:

a) *Grade 1* — Polyester polyol used for the manufacturing of cellular materials like rigid polyurethane foams, flexible/slab stock. The form of polyester polyol is liquid.
b) *Grade 2* — Polyester polyol used for the manufacturing of micro cellular materials like footwear, noise vibration and harshness (NVH). The form of polyester polyol is liquid to waxy solids.
c) *Grade 3* — Polyester polyol used for the manufacturing of specialty materials like coatings, adhesives, sealants and elastomers, flexible packaging and other applications. The form of polyester polyol is liquid and solid.

4 REQUIREMENT

The material shall comply with the requirements as given in Table 1.

5 PACKING AND MARKING

5.1 Packing

The material shall be packed in suitable drums or bulk tankers conforming to local transportation guidelines.

5.2 Marking

5.2.1 Each container shall be securely closed and shall bear and indelibly the following information:

a) Name of the material;
b) Name of the manufacturer;
c) Lot or batch number; and
d) Net weight.

5.2.2 *BIS Certification Marking*

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

6 SAMPLING

6.1 The method of drawing representative samples of the material and the criteria for conformity shall be as prescribed in **3** of IS 5299.

6.2 Tests for the determination of all other characteristics given in Table 1 shall be conducted.

6.3 Criteria for Conformity

6.3.1 *For Composite Sample*

For declaring the conformity of a lot to the requirements of all the other characteristics tested on the composite sample, the test result for each of the characteristics shall satisfy the relevant requirement given in Table 1.

Table 1 Requirement of Polyester Polyols

(*Clauses* 4, 6.2 *and* 6.2.1)

Sl No.	**Characteristic**	**Grade**				**Method of Test, Refer to IS/ISO/ASTM**
		Grade 1	Grade 2	Grade 3		
		Liquid	Liquid	Liquid	Solid	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
i)	Visual appearance	Clear yellow to dark brown liquid	Clear to yellow colour liquid/waxy	Yellow to brown colour	Clear yellow to brown colour	–
ii)	Hydroxyl value, mg-KOH/g, *Max*	450	75	400	–	ISO 14900/ ASTM D4274
iii)	Acid value, mg-KOH/g, *Max*	3	2	20	–	ASTM D4662
iv)	Water content/Moisture, percent, *Max*	0.50	0.15	0.15	–	Annex A of IS 15030/ASTM E203
v)	Viscosity at 25 °C, mPa-s, *Max*	25 000	–	70 000	–	13360 (Part 11/Sec 11)/ ISO 3219
vi)	Viscosity at 35 °C, mPa-s, *Max*	–	25 000	–	–	
vii)	Viscosity at 70 °C, mPa-s, *Max*	–	–	–	1 600	

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Plastics Sectional Committee, PCD 12

Organization	*Representative(s)*
Central Institute of Plastics Engineering and Technology, Chennai	Shri Samir Kumar Biswas (***Chairman***)
Central Institute of Plastics Engineering and Technology (CIPET), Chennai	Dr S. N. Yadav
CSIR-Central Food Technological Research Institute (CFTRI), Mysore	Shri R. S. Matche
Indian Centre for Plastics in the Environment (ICPE), Mumbai	Shri T. K. Bandopadhyay Shri Arunava Guha (*Alternate*)
CSIR-Indian Institute of Toxicological Research (IITR), Lucknow	Dr V. P. Sharma Dr A. B. Pant (*Alternate*)
Reliance Industries Ltd (RIL), Mumbai	Shri S. V. Raju Shri Ajay Shah (*Alternate*)
SABIC Innovative Plastics, Bengaluru	Dr Sumanda Bandyopadhyay Shri Sachin S. Unde (*Alternate*)
Haldia Petrochemicals Limited, Kolkata	Shri Raj K. Datta Suvomoy Ganguly (*Alternate*)
Ministry of Environment and Forests (MoEF), New Delhi	Shri Sharath Kumar Pallerla Shri Shard Sapra (*Alternate*)
Indian Institute of Packaging (IIP), Mumbai	Shri Madhab Chakraborty Dr Tanweer Alam (*Alternate*)
GAIL (India) Ltd, NOIDA	Shri Manish Khandelwal
CSIR-National Chemical Laboratory (NCL), Pune	Dr Harshawardhan Pol Dr Kadhiravan Shanmuganathan (*Alternate*)
Indian Plastic Institute (IPI), Mumbai	Shri V. B. Lall Shri Mihir Banerji (*Alternate*)
Voluntary Organization in Interest of Consumer Education (VOICE), New Delhi	Shri M. A. U. Khan Shri H. Wadhwa (*Alternate*)
All India Plastics Manufacturers Association (AIPMA), New Delhi	Shri Deepak Ballani
The Toy Association of India (TAI), New Delhi	Shri Rajesh Arora Shri R. K. Verma (*Alternate*)
Department of Chemicals and Petrochemicals, Ministry of Chemicals and Fertilizers, New Delhi	Shri Dinesh Kumar
Organization of Plastics Processors of India, Mumbai	Mr Deepak Lawale Dr Satyaprasad Bhattacharya (*Alternate*)
Plastindia Foundation, Mumbai	Dr E. Sundaresan Shri Hiten Bheda (*Alternate*)
Central Pollution Control Board, New Delhi	Dr A. B. Akolkar Dr S. K. Nigam (*Alternate*)

Organization	*Representative(s)*
National Committee on Plasticulture Applications in Horticulture (NCPAH), Ministry of Agriculture and Farmers Welfare, Govt of India, New Delhi	SHRI ANAND ZAMBRE SHRI KRISHNA KUMAR KAUSHAL (*Alternate*)
Indian Oil Corporation, R & D Centre, Faridabad	DR G. S. KAPUR SHRI DHANANJAY SAHOO (*Alternate*)
ONGC Petro Additions Ltd (OPAL), Gujarat	SHRI VIVEK MEHTA
Chemical and Petrochemical Manufactures Association (CPMA) New Delhi	SHRI KAMAL NANAVATY
Consumer Association of India (CONCERT), Chennai	SHRI G. SANTHANARAJAN SHRI M. R. KRISHNAN (*Alternate*)
Coca-Cola India Pvt Ltd	SHRI RAJENDRA DOBRIYAL SHRI VIRENDRA LANDGE (*Alternate*)
Huhtamaki Paper Product Ltd (HPPL), Hyderabad	SHRI ATINDRA N. CHAUDHURI
HMEL, Noida	SHRI VINEET KUMAR GUPTA SHRI ALAKESH GHOSH (*Alternate*)
Food Safety and Standards Authority of India (FSSAI), Delhi	SHRI CHIRAG GADI
Indian Pharmacopoeia Commission, Ghaziabad	DR JAI PRAKASH DR MANOJ KUMAR PANDEY (*Alternate*)
Technical Training and Research Centre (TTRC), Lohia Group, Kanpur	SHRI R. K. DWIVEDI
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Food Corporation of India (FCI), Delhi	SHRI A. S. ARUNACHALAM SHRI A. K. U. B. SINGH (*Alternate*)
Shivalik Agro-Poly Products Ltd, Mohali	SHRI PANKAJ KUMAR MAHAJAN DR G. D. TYAGI (*Alternate*)
BIS Director General	SHRIMATI NAGAMANI T., SCIENTIST 'E' AND HEAD (PCD) [REPRESENTING DIRECTOR GENERAL (*Ex-officio*)]

Member Secretary

SHRI SHIVAM DWIVEDI
SCIENTIST 'B' (PCD), BIS

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Amendments Issued Since Publication

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